

基于TDOA的超声波室内定位系统的设计与实现

作者：韩霜, 罗海勇, 陈颖, 丁玉珍

单位：北京邮电大学信息与通信工程学院

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摘要：

本文设计并实现了一种基于射频与超声波信号到达时间差的高精度室内定位系统，用于无线传感器网络中节点的定位和跟踪。系统中位置固定的信标节点周期性同步发射射频信号与超声波脉冲，待定位的移动节点测量接收到的射频和超声波信号的到达时间差，并将此数据采用分时的方式发送至中心控制主机。中心控制主机应用实验中得出的时间补偿参数，计算移动节点与信标节点之间的距离，最后采用极大似然估计算法实现目标的定位。实验结果表明，该系统的平均定位误差在10cm以内，具有较高的定位精度。

关键词：无线传感器网络；室内定位；到达时间差；极大似然估计

The Design and Implementation of a TDOA-based Ultrasonic Indoor Localizing System

Author's Name:

Institution:

Abstract:

This paper presents an indoor localizing system that provides accurate location of the nodes in wireless sensor networks. In this system, beacon nodes transmit radio frequency (RF) signals together with ultrasonic pulses simultaneously and periodically; mobile nodes receive these RF and ultrasonic signals, correlate them to each other, measure the time difference of arrival, estimate the distance to each beacon and perform data transmission to the centralized controlling system. Applying the compensation parameters obtained from the experiments, the controlling system implements localizing and tracking of the targets using maximum likelihood estimation algorithm. According to the experimental results, this localizing system has a high degree accuracy within 10cm.

Keywords: wireless sensor networks; indoor localization; time difference of arrival; maximum likelihood estimation

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